1 OVERVIEW OF RISK MANAGEMENT DOCUMENT

This document is intended to help the reader gain an understanding of potential environmental problems associated with Concentrated Animal Feeding Operations (CAFOs). Although a variety of animals are raised in CAFOs, this document will focus on beef, dairy, swine and poultry. The quantities and characteristics of manure produced by the different animals are presented. The watershed stressors resulting from CAFO pollution are discussed, as are the transport mechanisms that disperse them through the environment. Common manure management practices are also presented.

Because large numbers of animals are confined in relatively small areas at CAFOs, a very large volume of manure is produced and must be kept in a correspondingly small area until disposed of. The age-old practice of land application is used, but the volumes of manure that must be disposed in this way frequently exceed the assimilative capacity of land within economic transport distances. This may result in the release of excess manure to watershed environments during the catastrophic breach of holding facilities or more commonly, during the intermittent runoff of excess manure applied to already saturated land. Figure 1.1 shows the phosphorus assimilative capacity of farmland in the United States. Figure 1.2 shows the excess phosphorus available on farms with no export. Clearly, an imbalance exists between available phosphorus and the capacity of the land to absorb phosphorus. The same general relationship holds for nitrogen. If land in entire counties were available for application of animal waste, the overburden of nutrients is somewhat relieved, but excess quantities of nutrients still exist in some locales. Neither of the maps shown takes into account fertilizer applied to fields.

This would be a problem even if manure contained only beneficial nutrients. In excess amounts, these nutrients damage, not improve, soil fertility and may pollute nearby water. More importantly, however, manure from CAFOs contains components other than nutrients. The dominant element in manure is carbon. Many of the carbon compounds in manure may contribute to oxygen depletion in water. The nutrient elements N and P in manures may also contribute to eutrophication of water if their entry into water is not controlled. Modern agriculture with its emphasis on intensive housing and speeding the growth of livestock to market weight has employed a variety of substances that have not been used before in animal husbandry. These include antibiotics to combat the spread of disease among animals housed in close quarters, natural and synthetic hormones to speed growth, and metals (As, Cu, Zn) to do the same and preserve the freshness of feed. When present in the large amounts of manure generated at CAFOs and stored on-site, these other substances pose a threat to the environment. The effects of antibiotics on native soil bacteria are largely unknown. The effects of biogenic and synthetic hormones on other animals and humans are largely unknown.

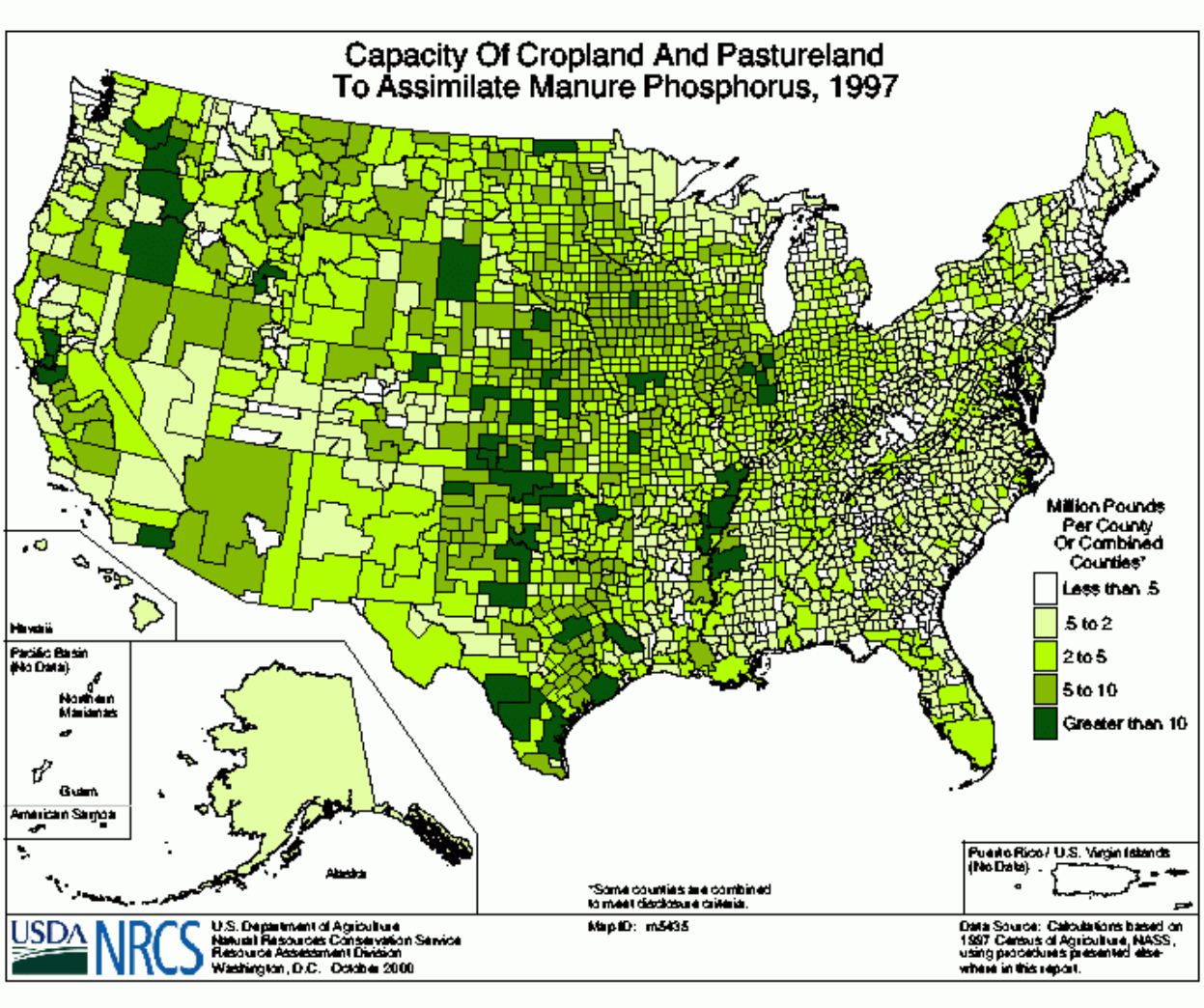

Figure 1.1. Phosphorus assimilative capacity for farms.

This Risk Management Evaluation (RME) is intended to document the salient environmental risks associated with hog, poultry, dairy and beef CAFOs and actions that could be taken to reduce those risks now. Areas in which further research is needed are identified and discussed in Section 8 of this document.

In reviewing the existing body of knowledge on intensive livestock agriculture, the following points became clear.

- Underlying all of the environmental problems associated with CAFOs is the fact that too much manure accumulates in restricted areas. Traditional means of using manure are not adequate to contend with the large volumes present at CAFOs.

- The nutrient load from CAFOs is large, with about 2.5 billion pounds of N and 1.4 billion pounds of P recoverable in manure. Total manure N is about 12.9 billion pounds and total manure P is about 3.8 billion pounds.

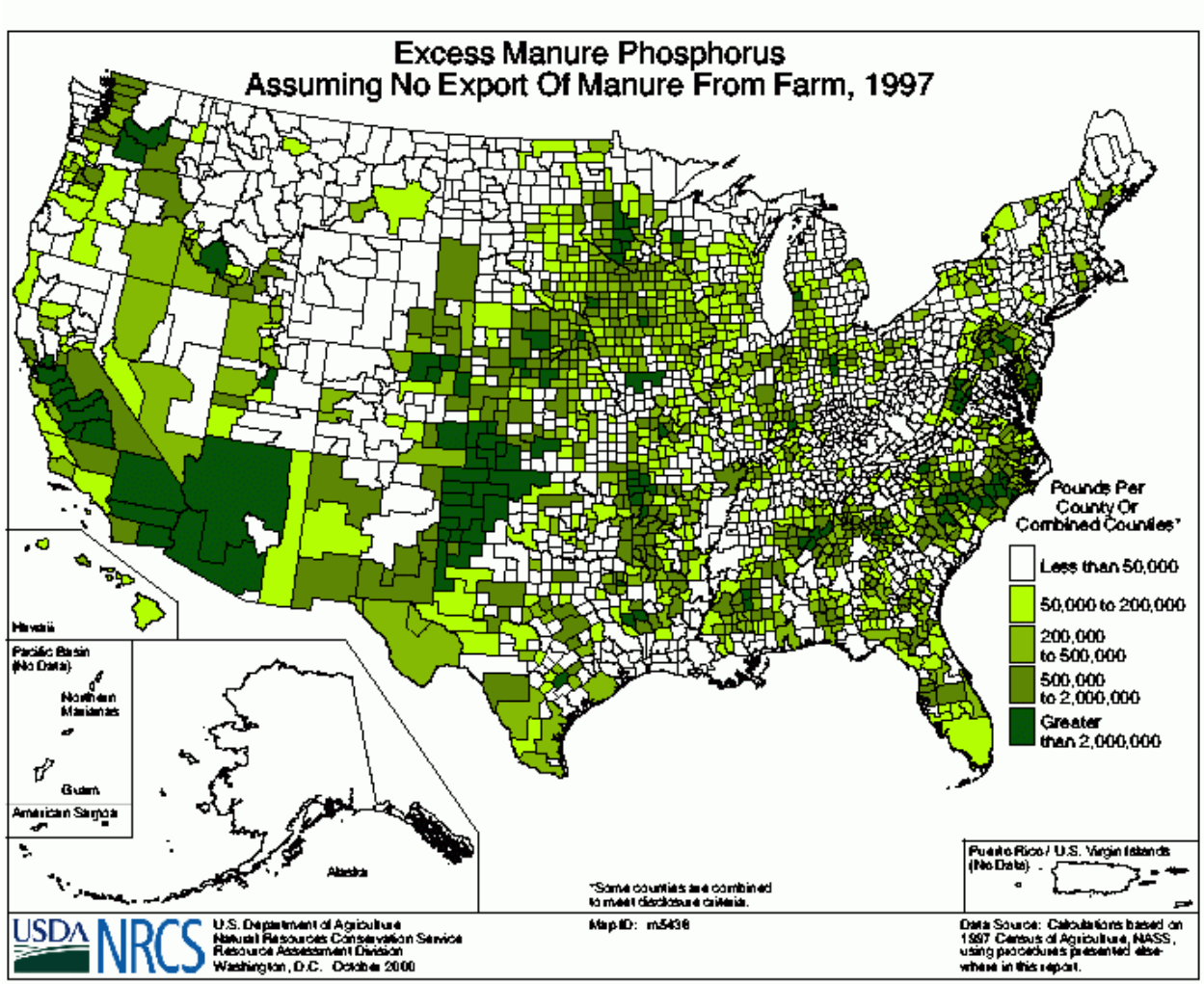

Figure 1.2. Excess phosphorus on farms with no export.

- CAFO manure contains potentially pathogenic microorganisms. The combination of large herds and closely confined housing makes it likely that at least some animals are asymptomatic carriers of pathogenic organisms. Once introduced, these pathogens may readily spread among the closely confined herd. Shed into the manure, these pathogens find favorable breeding grounds in the barns, manure storage and handling systems and are released into the watershed environment routinely during the land application of waste.

- The antibiotics administered to CAFO livestock may contribute to the development of antibiotic resistant strains of pathogens – especially those harbored within the livestock raised at these facilities. The sub-therapeutic use of antibiotics at CAFOs aggravates the problem.

- Naturally occurring and synthetic hormones administered to livestock to speed growth to market weight pollute the environment when released along with manure during land application or during an accidental release. The environmental effects of these compounds are largely unknown.

- Metals used as feed supplements to promote livestock growth may degrade the quality of the land to which waste is applied. Adverse environmental effects may result when waste containing metals is released into the watershed.

- Transport pathways for stressors from CAFOs encompass surface runoff, air transport and redeposition, and groundwater flow. Nutrients, pathogenic organisms, hormones and metals may easily reach waterbodies via these means.

There are measures that may be taken now to mitigate the risk posed by the large volumes of manure at CAFOs.

- Reduce the volumes of manure created by changing waste management, handling practices, and feed utilization efficiency.

- Treat manure to kill pathogens, attenuate hormones and other organic contaminants, and stabilize metals.

- Increase use of anaerobic treatment and composting to control odors, nutrients, pathogens, and generate renewable energy.

- Reduce the use of antibiotics to stem the development of antibiotic resistant pathogens.

- Increase soil conservation methods to reduce runoff and erosion from fields to which manure has been applied. Reduced tillage, terraces, grassed waterways, and contour planting offer conservation benefits.

- Install barriers such as riparian zones and wetlands to prevent manure-laden runoff from fields from reaching streams.

- Change barn ventilation and manure management and handling practices to minimize the airborne release of stressors.

- Where economic factors work against making changes to CAFO management practices, eliminate them or provide incentives for making such changes.

Additional research needs to be undertaken to develop a range of alternatives for managing CAFO manure. The U.S. Department of Agriculture is engaged in research to address many of these questions, especially with respect to nutrient issues. EPA intends to complement their efforts by working with them on mitigation strategies for nutrients and, more importantly, focusing on pathogen, hormone and metal issues.

The environmental challenges posed by CAFOs are not insoluble. In some cases, simple management of wastes in different ways will ameliorate some of the problems. More attention to good soil management and application of wastes at phosphorus based agronomic rates will reduce loads of pollutants reaching water bodies. Development of means to extract value from wastes will be needed to make treatment feasible and reduce health risks. Nitrogen, phosphorus and methane are some of the potentially valuable products recoverable from manures. The key problem for managing CAFO waste is one of distribution of the manure from points of production to application sites in an economically viable manner.

Beyond manure management, new issues are emerging such as the environmental impact of aquaculture and other intensive agricultural operations, the environmental effects of different types of mortality management, and how to mitigate the hydrologic changes brought about by large CAFO operations. These issues will be addressed in future versions of this RME.